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CLAIMS

[Claim(s)]

[Claim 1]A hydrogen peroxide sterilizer comprising:

A treatment container in which a thing to be sterilized is stored.

A hydrogen peroxide feed unit which supplies hydrogen peroxide in this treatment container.

An ozone addition device which adds ozone in a treatment container after supplying hydrogen peroxide in a treatment container from this hydrogen peroxide feed unit.

[Claim 2]The hydrogen peroxide sterilizer according to claim 1 which constituted an ozone addition device, passes a humidifying device and added ozone from this ozone addition device into a treatment container with a discharge system ozone generating device which changes oxygen into ozone.

[Claim 3]The hydrogen peroxide sterilizer according to claim 1 or 2 which decomposed ozone of a surplus after disassembling hydrogen peroxide, and was provided with an ozone degradation device which carries out air discharge.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a hydrogen peroxide sterilizer.

[0002]

[Description of the Prior Art]Generally, although various medical instruments need to perform sterilization treatment, using hydrogen peroxide (H_2O_2) as gas sterilizing is examined in recent years.

[0003]Although what was indicated to the former, for example, JP,11-193010,A etc., exists as art about sterilization using this kind of hydrogen peroxide, After in the case of the conventional hydrogen peroxide sterilizer putting in a thing to be sterilized in a treatment container, decompressing the inside of a treatment container, supplying hydrogen peroxide and sterilizing a thing to be sterilized, in order to lose the influence by the residual toxicity of hydrogen peroxide, it ventilates by decompressing the inside of a treatment container and introducing the atmosphere.

[0004]

[Problem(s) to be Solved by the Invention]However, only by ventilating by only decompressing the inside of a treatment container and introducing the atmosphere after the end of sterilization treatment of a thing to be sterilized like the above-mentioned, The hydrogen peroxide which stuck to this thing to be sterilized depending on the construction material of a thing to be sterilized could not be removed, but it had a problem of it becoming impossible to disregard the influence by the residual toxicity of hydrogen peroxide.

[0005]In view of this actual condition, this invention decomposes into water and oxygen, can remove the hydrogen peroxide which stuck to the thing to be sterilized, and tends to provide the hydrogen peroxide sterilizer which can avoid the influence by the residual toxicity of hydrogen peroxide.

[0006]

[Means for Solving the Problem]A thing concerning a hydrogen peroxide sterilizer this invention is characterized by that comprises the following.

A treatment container in which a thing to be sterilized is stored.

A hydrogen peroxide feed unit which supplies hydrogen peroxide in this treatment container.

An ozone addition device which adds ozone in a treatment container after supplying hydrogen peroxide in a treatment container from this hydrogen peroxide feed unit.

[0007]In said hydrogen peroxide sterilizer, with a discharge system ozone generating device which changes oxygen into ozone, an ozone addition device is constituted, a humidifying device is passed and ozone from this ozone addition device can be added into a treatment container.

[0008]Ozone of a surplus after disassembling hydrogen peroxide is decomposed, and it can have an ozone degradation device which carries out air discharge.

[0009]A hydrogen-peroxide-concentration sensor which detects hydrogen peroxide concentration in a treatment container again, It can have a control device which outputs a control signal which adjusts an ozone addition based on hydrogen peroxide concentration detected by this hydrogen-peroxide-concentration sensor to an ozone addition device, In this case, an ozone addition based on hydrogen peroxide concentration detected by a hydrogen-peroxide-concentration sensor is lessened, and addition of ozone is divided into multiple times and it may be made to perform it.

[0010]According to the above-mentioned means, the following operations are obtained.

[0011]Where a thing to be sterilized is put in a treatment container, if hydrogen peroxide is supplied from a hydrogen peroxide feed unit in a treatment container, sterilization of a thing to be sterilized will be performed by reaction of hydrogen peroxide and a bacillus, but. After supplying hydrogen peroxide in a treatment container from said hydrogen peroxide feed unit, when ozone is added from an ozone addition device in a treatment container, by the reaction of hydrogen peroxide and ozone. It becomes possible to decompose into water and oxygen and to remove hydrogen peroxide which stuck to a thing to be sterilized, and influence by the residual toxicity of hydrogen peroxide is avoided.

[0012]If an ozone addition device is constituted, a humidifying device is passed and ozone from this ozone addition device is added into a treatment container in said hydrogen peroxide sterilizer with a discharge system ozone generating device which changes oxygen into ozone, A humidifying device becomes easy to remove nitrogen oxides by which it is generated with a discharge system ozone generating device.

[0013]Even if ozone will be superfluously added in order to disassemble hydrogen peroxide if ozone of a surplus after disassembling hydrogen peroxide is decomposed and it has an ozone degradation device which carries out air discharge, Since it is decomposed and air discharge is detoxicated and carried out in an ozone degradation device, ozone of a surplus after disassembling hydrogen peroxide becomes possible [ensuring processing of ozone which remains].

[0014]A hydrogen-peroxide-concentration sensor which detects hydrogen peroxide concentration in a treatment container again, If it has a control device which outputs a control signal which adjusts an ozone addition based on hydrogen peroxide concentration detected by this hydrogen-peroxide-concentration sensor to an ozone addition device, It becomes possible to add ozone of quantity which is needed in order to make it react to hydrogen peroxide according to hydrogen peroxide concentration in a treatment container, In this case, if an ozone addition based on hydrogen peroxide concentration detected by a hydrogen-peroxide-concentration sensor is lessened and it is made to carry out by dividing addition of ozone into multiple times, It becomes possible to carry out the whole-quantity reaction of the ozone added to hydrogen peroxide, and it is avoided that ozone remains and it is lost. [of futility]

[0015]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with the example of a graphic display.

[0016]Drawing 1 is this invention an example of the gestalt to carry out, and fundamentally, The treatment container 3 in which the thing 2 put in the bag for sterilization 1 to be sterilized is stored, and the hydrogen peroxide feed unit 23 which supplies hydrogen peroxide in this treatment container 3, After supplying hydrogen peroxide in the treatment container 3 from this hydrogen peroxide feed unit 23, it has the ozone addition device 6 which adds ozone in the treatment container 3.

[0017]In the case of this example of a graphic display, said hydrogen peroxide feed unit 23, The hydrogen-peroxide-solution tank 23a by which hydrogen peroxide solution was stored, and the vaporizer 23b which makes the hydrogen peroxide solution stored in this hydrogen-peroxide-solution tank 23a evaporate constitute, The temperature sensor 8 which detects the temperature 7 in this treatment container 3 in said treatment container 3, The humidity sensor 10 which detects the humidity 9 in the treatment container 3, and the hydrogen-peroxide-concentration sensor 25 which detects the hydrogen peroxide concentration 24 in the treatment container 3, The heating apparatus 4, such as a heater which heats the inside of the treatment container 3 to a sterilization treatment temperature requirement while attaching the ozone level sensor 12 which detects the ozone level 11 in the treatment container 3, The pump 13 for decompression as the humidifying device 5 which humidifies the inside of said treatment container 3, and a pressure reducing device for decompressing the inside of the treatment container 3, before supplying hydrogen peroxide, and exhausting hydrogen peroxide in the treatment container 3 after the end of sterilization treatment of the thing 2 to be sterilized, The ozone degradation devices 14, such as a catalyst type for decomposing ozone in the treatment container 3 exhausted by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, and detoxicating and carrying out air discharge, The valve 15 for introducing the atmosphere into the treatment container 3, when exhausting hydrogen peroxide in the treatment container 3 by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, The temperature 7 which forms the sterilization filter 16 for preventing the bacillus which exists in the atmosphere at the time of opening of this valve 15 from invading into the treatment container 3, and is further detected with said temperature sensor 8, In [form the control device 17 into which the humidity 9 detected with the humidity sensor 10, the hydrogen peroxide concentration 24

detected by the hydrogen-peroxide-concentration sensor 25 and the ozone level 11 detected by the ozone level sensor 12 are inputted, and] this control device 17, Based on detecting signals, such as said temperature 7, the humidity 9, the hydrogen peroxide concentration 24, and the ozone level 11, Grasp the state in said treatment container 3, and the control signal 18 which heats the inside of said treatment container 3 to a sterilization treatment temperature requirement is outputted to said heating apparatus 4, After heating the inside of said treatment container 3 to a sterilization treatment temperature requirement, output the control signal 26 which supplies hydrogen peroxide to said hydrogen peroxide feed unit 23, and the control signal 19 which adjusts the ozone-addition added into the treatment container 3 after hydrogen peroxide supply is outputted to said ozone addition device 6, The control signal 20 which the inside of the treatment container 3 is decompressed before supplying hydrogen peroxide, and exhausts hydrogen peroxide in the treatment container 3 after the end of sterilization treatment of the thing 2 to be sterilized is outputted to said pump 13 for decompression, The ozone degradation device 14 HE output of the control signal 21 which decomposes ozone in the treatment container 3 exhausted by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, and detoxicates and carries out air discharge is carried out [aforementioned]. When exhausting hydrogen peroxide in the treatment container 3 by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, it is made to have outputted the opening signal 22 which introduces the atmosphere into the treatment container 3 to said valve 15.

[0018]In the case of this example of a graphic display, said ozone addition device 6, It constitutes from the oxygen generator 6a made to generate oxygen and the discharge system ozone generating device 6b which changes into ozone the oxygen supplied from this oxygen generator 6a, and ozone from this ozone addition device 6 is supplied into the treatment container 3 through the humidifying device 5.

[0019]Next, the operation of the above-mentioned example of a graphic display is explained.

[0020]First, if the thing 2 put in the bag for sterilization 1 to be sterilized is stored in the treatment container 3, The temperature 7 detected with the temperature sensor 8, and the humidity 9 detected with the humidity sensor 10, The hydrogen peroxide concentration 24 detected by the hydrogen-peroxide-concentration sensor 25 is inputted into the control device 17, It is decompressed until the inside of the treatment container 3 becomes below in predetermined pressure (about below $100[\text{Torr}] = 100 \times 1.33322 \times 10^2 [\text{Pa}]$) before the pump 13 for decompression operating with the control signal 20 outputted from this control device 17 and supplying hydrogen peroxide, The heating apparatus 4 operates with the control signal 18 outputted from the control device 17, and the inside of the treatment container 3 is heated in a sterilization treatment temperature requirement (for example, about $35\text{--}40 [^{\circ}\text{C}]$ grade), and. The hydrogen-peroxide-solution tank 23a and the vaporizer 23b of said hydrogen peroxide feed unit 23 operate with the control signal 26 outputted from the control device 17, Hydrogen peroxide from the hydrogen-peroxide-solution tank 23a of this hydrogen peroxide feed unit 23 is evaporated with the vaporizer 23b, it is supplied into the treatment container 3, and sterilization treatment of the thing 2 to be sterilized is performed. Supply of hydrogen peroxide from said hydrogen peroxide feed unit 23 stops, before the inside of said treatment container 3 serves as positive pressure to atmospheric pressure.

[0021]After time required for sterilization of said thing 2 to be sterilized passes and sterilization treatment is completed, The oxygen generator 6a and the discharge system ozone generating device 6b of the ozone addition device 6 operate with the control signal 19 outputted from the control device 17 based on the hydrogen peroxide concentration 24 in the treatment container 3, Oxygen from the oxygen generator 6a of this ozone addition device 6 is changed into ozone with the discharge system ozone generating device 6b, and is supplied into the treatment container 3 through the humidifying device 5. When the discharge system ozone generating device 6b which changes oxygen into ozone constitutes the ozone addition device 6 here, are generated by nitrogen oxides, but, In this example of a graphic display, the humidifying device 5 is easy to remove the nitrogen oxides which generate ozone from the ozone addition device 6 with the discharge system ozone generating device 6b in order to pass the humidifying device 5 and to make it have added into the treatment container 3.

[0022]If ozone is added from the ozone addition device 6 in said treatment container 3, hydrogen peroxide and ozone, [Formula 1] $\text{H}_2\text{O}_2 + \text{O}_3 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ It reacts, as shown in a reaction formula called 2O_2 , and it becomes possible to decompose into water and oxygen and to remove the hydrogen peroxide which stuck to the thing 2 to be sterilized, and the influence by the residual toxicity of hydrogen peroxide is avoided.

[0023]Before adding ozone from the ozone addition device 6 in said treatment container 3, An addition of ozone can be lessened, if it may be made to add ozone and does in this way, since it ventilates by operating the pump 13 for decompression, decompressing inside of the treatment container 3, and introducing the atmosphere, hydrogen

peroxide is once discharged to the exterior and the hydrogen peroxide concentration 24 in the treatment container 3 is reduced.

[0024]An ozone addition from said ozone addition device 6 to into the treatment container 3. It is adjusted according to the hydrogen peroxide concentration 24 detected by said hydrogen-peroxide-concentration sensor 25, and by this, it is possible to add ozone of quantity which is needed in order to make it react to hydrogen peroxide. In this case, if an ozone addition based on the hydrogen peroxide concentration 24 detected by the hydrogen-peroxide-concentration sensor 25 is lessened and it is made to carry out by dividing addition of ozone into multiple times, It becomes possible to carry out the whole-quantity reaction of the ozone added to hydrogen peroxide, and it is avoided that ozone remains and it is lost. [of futility] The ozone level 11 in said treatment container 3 is supervised by the ozone level sensor 12, and if it seems that concentration in the treatment container 3 of ozone exceeds prescribed concentration, Said ozone addition device 6 is compulsorily suspended by the control signal 19 from the control device 17, and addition of ozone is stopped.

[0025]After decomposition removal of hydrogen peroxide by addition of said ozone is completed, in order that the ozone degradation device 14 may operate with the control signal 21 which said pump 13 for decompression operates again with the control signal 20 outputted from the control device 17, and is outputted from the control device 17, In order to disassemble hydrogen peroxide, even if ozone is added superfluously, ozone of a surplus after disassembling hydrogen peroxide, In said ozone degradation device 14, it is decomposed, and air discharge is detoxicated and carried out, After the valve 15 is wide opened by the opening signal 22 which it becomes possible to ensure processing of ozone which remains, then is outputted from the control device 17 and the atmosphere is introduced into the treatment container 3 via the sterilization filter 16, the thing 2 in the treatment container 3 to be sterilized is taken out. After air discharge of ozone in the treatment container 3, although it becomes a form where the atmosphere is inhaled by opening of the valve 15 in the treatment container 3, in order that the atmosphere may pass the sterilization filter 16, there is no fear of a bacillus which exists in the atmosphere invading into the treatment container 3.

[0026]In this way, it decomposes into water and oxygen, hydrogen peroxide which stuck to the thing 2 to be sterilized can be removed, and influence by the residual toxicity of hydrogen peroxide can be avoided.

[0027]A hydrogen peroxide sterilizer of this invention is not what is limited only to an above-mentioned example of a graphic display, As for an ozone addition device, it is needless to say by supplying water that change can be variously added within limits which do not deviate from a gist of this invention — a thing of an electrolysis type which generates ozone may be used.

[0028]

[Effect of the Invention]As mentioned above, as explained, according to the hydrogen peroxide sterilizer of this invention according to claim 1 to 5, it decomposes into water and oxygen, the hydrogen peroxide which stuck to the thing to be sterilized can be removed, and the outstanding effect that the influence by the residual toxicity of hydrogen peroxide can be avoided can be done so.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]This invention relates to a hydrogen peroxide sterilizer.

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PRIOR ART

[Description of the Prior Art]Generally, although various medical instruments need to perform sterilization treatment, using hydrogen peroxide (H_2O_2) as gas sterilizing is examined in recent years.

[0003]Although what was indicated to the former, for example, JP,11-193010,A etc., exists as art about sterilization using this kind of hydrogen peroxide, After in the case of the conventional hydrogen peroxide sterilizer putting in a thing to be sterilized in a treatment container, decompressing the inside of a treatment container, supplying hydrogen peroxide and sterilizing a thing to be sterilized, in order to lose the influence by the residual toxicity of hydrogen peroxide, it ventilates by decompressing the inside of a treatment container and introducing the atmosphere.

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EFFECT OF THE INVENTION

[Effect of the Invention]As mentioned above, as explained, according to the hydrogen peroxide sterilizer of this invention according to claim 1 to 5, it decomposes into water and oxygen, the hydrogen peroxide which stuck to the thing to be sterilized can be removed, and the outstanding effect that the influence by the residual toxicity of hydrogen peroxide can be avoided can be done so.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, only by ventilating by only decompressing the inside of a treatment container and introducing the atmosphere after the end of sterilization treatment of a thing to be sterilized like the above-mentioned, The hydrogen peroxide which stuck to this thing to be sterilized depending on the construction material of a thing to be sterilized could not be removed, but it had a problem of it becoming impossible to disregard the influence by the residual toxicity of hydrogen peroxide.

[0005]In view of this actual condition, this invention decomposes into water and oxygen, can remove the hydrogen peroxide which stuck to the thing to be sterilized, and tends to provide the hydrogen peroxide sterilizer which can avoid the influence by the residual toxicity of hydrogen peroxide.

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MEANS

[Means for Solving the Problem]A thing concerning a hydrogen peroxide sterilizer this invention is characterized by that comprises the following.

A treatment container in which a thing to be sterilized is stored.

A hydrogen peroxide feed unit which supplies hydrogen peroxide in this treatment container.

An ozone addition device which adds ozone in a treatment container after supplying hydrogen peroxide in a treatment container from this hydrogen peroxide feed unit.

[0007]In said hydrogen peroxide sterilizer, with a discharge system ozone generating device which changes oxygen into ozone, an ozone addition device is constituted, a humidifying device is passed and ozone from this ozone addition device can be added into a treatment container.

[0008]Ozone of a surplus after disassembling hydrogen peroxide is decomposed, and it can have an ozone degradation device which carries out air discharge.

[0009]A hydrogen-peroxide-concentration sensor which detects hydrogen peroxide concentration in a treatment container again, It can have a control device which outputs a control signal which adjusts an ozone addition based on hydrogen peroxide concentration detected by this hydrogen-peroxide-concentration sensor to an ozone addition device, In this case, an ozone addition based on hydrogen peroxide concentration detected by a hydrogen-peroxide-concentration sensor is lessened, and addition of ozone is divided into multiple times and it may be made to perform it.

[0010]According to the above-mentioned means, the following operations are obtained.

[0011]Where a thing to be sterilized is put in in a treatment container, if hydrogen peroxide is supplied from a hydrogen peroxide feed unit in a treatment container, sterilization of a thing to be sterilized will be performed by reaction of hydrogen peroxide and a bacillus, but. After supplying hydrogen peroxide in a treatment container from said hydrogen peroxide feed unit, when ozone is added from an ozone addition device in a treatment container, by the reaction of hydrogen peroxide and ozone. It becomes possible to decompose into water and oxygen and to remove hydrogen peroxide which stuck to a thing to be sterilized, and influence by the residual toxicity of hydrogen peroxide is avoided.

[0012]If an ozone addition device is constituted, a humidifying device is passed and ozone from this ozone addition device is added into a treatment container in said hydrogen peroxide sterilizer with a discharge system ozone generating device which changes oxygen into ozone, A humidifying device becomes easy to remove nitrogen oxides by which it is generated with a discharge system ozone generating device.

[0013]Even if ozone will be superfluously added in order to disassemble hydrogen peroxide if ozone of a surplus after disassembling hydrogen peroxide is decomposed and it has an ozone degradation device which carries out air discharge, Since it is decomposed and air discharge is detoxicated and carried out in an ozone degradation device, ozone of a surplus after disassembling hydrogen peroxide becomes possible [ensuring processing of ozone which remains].

[0014]A hydrogen-peroxide-concentration sensor which detects hydrogen peroxide concentration in a treatment container again, If it has a control device which outputs a control signal which adjusts an ozone addition based on hydrogen peroxide concentration detected by this hydrogen-peroxide-concentration sensor to an ozone addition device, It becomes possible to add ozone of quantity which is needed in order to make it react to hydrogen peroxide according to hydrogen peroxide concentration in a treatment container, In this case, if an ozone addition based on hydrogen peroxide concentration detected by a hydrogen-peroxide-concentration sensor is lessened and it is made to carry out by dividing addition of ozone into multiple times, It becomes possible to carry out the

whole-quantity reaction of the ozone added to hydrogen peroxide, and it is avoided that ozone remains and it is lost. [of utility]

[0015]

[Embodiment of the Invention] Hereafter, an embodiment of the invention is described with the example of a graphic display.

[0016] Drawing 1 is this invention an example of the gestalt to carry out, and fundamentally, The treatment container 3 in which the thing 2 put in the bag for sterilization 1 to be sterilized is stored, and the hydrogen peroxide feed unit 23 which supplies hydrogen peroxide in this treatment container 3, After supplying hydrogen peroxide in the treatment container 3 from this hydrogen peroxide feed unit 23, it has the ozone addition device 6 which adds ozone in the treatment container 3.

[0017] In the case of this example of a graphic display, said hydrogen peroxide feed unit 23, The hydrogen-peroxide-solution tank 23a by which hydrogen peroxide solution was stored, and the vaporizer 23b which makes the hydrogen peroxide solution stored in this hydrogen-peroxide-solution tank 23a evaporate constitute, The temperature sensor 8 which detects the temperature 7 in this treatment container 3 in said treatment container 3, The humidity sensor 10 which detects the humidity 9 in the treatment container 3, and the hydrogen-peroxide-concentration sensor 25 which detects the hydrogen peroxide concentration 24 in the treatment container 3, The heating apparatus 4, such as a heater which heats the inside of the treatment container 3 to a sterilization treatment temperature requirement while attaching the ozone level sensor 12 which detects the ozone level 11 in the treatment container 3, The pump 13 for decompression as the humidifying device 5 which humidifies the inside of said treatment container 3, and a pressure reducing device for decompressing the inside of the treatment container 3, before supplying hydrogen peroxide, and exhausting hydrogen peroxide in the treatment container 3 after the end of sterilization treatment of the thing 2 to be sterilized, The ozone degradation devices 14, such as a catalyst type for decomposing ozone in the treatment container 3 exhausted by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, and detoxicating and carrying out air discharge, The valve 15 for introducing the atmosphere into the treatment container 3, when exhausting hydrogen peroxide in the treatment container 3 by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, The temperature 7 which forms the sterilization filter 16 for preventing the bacillus which exists in the atmosphere at the time of opening of this valve 15 from invading into the treatment container 3, and is further detected with said temperature sensor 8, In [form the control device 17 into which the humidity 9 detected with the humidity sensor 10, the hydrogen peroxide concentration 24 detected by the hydrogen-peroxide-concentration sensor 25 and the ozone level 11 detected by the ozone level sensor 12 are inputted, and] this control device 17, Based on detecting signals, such as said temperature 7, the humidity 9, the hydrogen peroxide concentration 24, and the ozone level 11, Grasp the state in said treatment container 3, and the control signal 18 which heats the inside of said treatment container 3 to a sterilization treatment temperature requirement is outputted to said heating apparatus 4, After heating the inside of said treatment container 3 to a sterilization treatment temperature requirement, output the control signal 26 which supplies hydrogen peroxide to said hydrogen peroxide feed unit 23, and the control signal 19 which adjusts the ozone addition added into the treatment container 3 after hydrogen peroxide supply is outputted to said ozone addition device 6, The control signal 20 which the inside of the treatment container 3 is decompressed before supplying hydrogen peroxide, and exhausts hydrogen peroxide in the treatment container 3 after the end of sterilization treatment of the thing 2 to be sterilized is outputted to said pump 13 for decompression, The ozone degradation device 14 HE output of the control signal 21 which decomposes ozone in the treatment container 3 exhausted by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, and detoxicates and carries out air discharge is carried out [aforementioned], When exhausting hydrogen peroxide in the treatment container 3 by the operation of said pump 13 for decompression after the end of sterilization treatment of the thing 2 to be sterilized, it is made to have outputted the opening signal 22 which introduces the atmosphere into the treatment container 3 to said valve 15.

[0018] In the case of this example of a graphic display, said ozone addition device 6, It constitutes from the oxygen generator 6a made to generate oxygen and the discharge system ozone generating device 6b which changes into ozone the oxygen supplied from this oxygen generator 6a, and ozone from this ozone addition device 6 is supplied into the treatment container 3 through the humidifying device 5.

[0019] Next, the operation of the above-mentioned example of a graphic display is explained.

[0020] First, if the thing 2 put in the bag for sterilization 1 to be sterilized is stored in the treatment container 3,

The temperature 7 detected with the temperature sensor 8, and the humidity 9 detected with the humidity sensor 10. The hydrogen peroxide concentration 24 detected by the hydrogen-peroxide-concentration sensor 25 is inputted into the control device 17. It is decompressed until the inside of the treatment container 3 becomes below, in predetermined pressure (about below $100[\text{Torr}] = 100 \times 1.33322 \times 10^2 [\text{Pa}]$) before the pump 13 for decompression operating with the control signal 20 outputted from this control device 17 and supplying hydrogen peroxide. The heating apparatus 4 operates with the control signal 18 outputted from the control device 17, and the inside of the treatment container 3 is heated in a sterilization treatment temperature requirement (for example, about 35-40 [°C] grade), and. The hydrogen-peroxide-solution tank 23a and the vaporizer 23b of said hydrogen peroxide feed unit 23 operate with the control signal 26 outputted from the control device 17. Hydrogen peroxide from the hydrogen-peroxide-solution tank 23a of this hydrogen peroxide feed unit 23 is evaporated with the vaporizer 23b, it is supplied into the treatment container 3, and sterilization treatment of the thing 2 to be sterilized is performed. Supply of hydrogen peroxide from said hydrogen peroxide feed unit 23 stops, before the inside of said treatment container 3 serves as positive pressure to atmospheric pressure.

[0021] After time required for sterilization of said thing 2 to be sterilized passes and sterilization treatment is completed, The oxygen generator 6a and the discharge system ozone generating device 6b of the ozone addition device 6 operate with the control signal 19 outputted from the control device 17 based on the hydrogen peroxide concentration 24 in the treatment container 3. Oxygen from the oxygen generator 6a of this ozone addition device 6 is changed into ozone with the discharge system ozone generating device 6b, and is supplied into the treatment container 3 through the humidifying device 5. When the discharge system ozone generating device 6b which changes oxygen into ozone constitutes the ozone addition device 6 here, are generated by nitrogen oxides, but. In this example of a graphic display, the humidifying device 5 is easy to remove the nitrogen oxides which generate ozone from the ozone addition device 6 with the discharge system ozone generating device 6b in order to pass the humidifying device 5 and to make it have added into the treatment container 3.

[0022] If ozone is added from the ozone addition device 6 in said treatment container 3, hydrogen peroxide and ozone, $[\text{Formula } 1] \text{H}_2\text{O}_2 + \text{O}_3 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ It reacts, as shown in a reaction formula called 2O_2 , and it becomes possible to decompose into water and oxygen and to remove the hydrogen peroxide which stuck to the thing 2 to be sterilized, and the influence by the residual toxicity of hydrogen peroxide is avoided.

[0023] Before adding ozone from the ozone addition device 6 in said treatment container 3, An addition of ozone can be lessened, if it may be made to add ozone and does in this way, since it ventilates by operating the pump 13 for decompression, decompressing inside of the treatment container 3, and introducing the atmosphere, hydrogen peroxide is once discharged to the exterior and the hydrogen peroxide concentration 24 in the treatment container 3 is reduced.

[0024] An ozone addition from said ozone addition device 6 to into the treatment container 3, It is adjusted according to the hydrogen peroxide concentration 24 detected by said hydrogen-peroxide-concentration sensor 25, and by this, It is possible to add ozone of quantity which is needed in order to make it react to hydrogen peroxide. In this case, if an ozone addition based on the hydrogen peroxide concentration 24 detected by the hydrogen-peroxide-concentration sensor 25 is lessened and it is made to carry out by dividing addition of ozone into multiple times, It becomes possible to carry out the whole-quantity reaction of the ozone added to hydrogen peroxide, and it is avoided that ozone remains and it is lost. [of utility] The ozone level 11 in said treatment container 3 is supervised by the ozone level sensor 12, and if it seems that concentration in the treatment container 3 of ozone exceeds prescribed concentration, Said ozone addition device 6 is compulsorily suspended by the control signal 19 from the control device 17, and addition of ozone is stopped.

[0025] After decomposition removal of hydrogen peroxide by addition of said ozone is completed, in order that the ozone degradation device 14 may operate with the control signal 21 which said pump 13 for decompression operates again with the control signal 20 outputted from the control device 17, and is outputted from the control device 17. In order to disassemble hydrogen peroxide, even if ozone is added superfluously, ozone of a surplus after disassembling hydrogen peroxide, In said ozone degradation device 14, it is decomposed, and air discharge is detoxicated and carried out. After the valve 15 is wide opened by the opening signal 22 which it becomes possible to ensure processing of ozone which remains, then is outputted from the control device 17 and the atmosphere is introduced into the treatment container 3 via the sterilization filter 16, the thing 2 in the treatment container 3 to be sterilized is taken out. After air discharge of ozone in the treatment container 3, although it becomes a form where the atmosphere is inhaled by opening of the valve 15 in the treatment container 3, in order that the atmosphere may pass the sterilization filter 16, there is no fear of a bacillus which exists in the atmosphere

invading into the treatment container 3.

[0026]In this way, it decomposes into water and oxygen, hydrogen peroxide which stuck to the thing 2 to be sterilized can be removed, and influence by the residual toxicity of hydrogen peroxide can be avoided.

[0027]A hydrogen peroxide sterilizer of this invention is not what is limited only to an above-mentioned example of a graphic display. As for an ozone addition device, it is needless to say by supplying water that change can be variously added within limits which do not deviate from a gist of this invention — a thing of an electrolysis type which generates ozone may be used.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is an outline lineblock diagram of an example of a gestalt which carries out this invention.

[Description of Notations]

- 1 Bag for sterilization
- 2 A thing to be sterilized
- 3 Treatment container
- 4 Heating apparatus
- 5 Humidifying device
- 6 Ozone addition device
- 6b Discharge system ozone generating device
- 14 Ozone degradation device
- 17 Control device
- 19 Control signal
- 23 Hydrogen peroxide feed unit
- 24 Hydrogen peroxide concentration
- 25 Hydrogen-peroxide-concentration sensor

[Translation done.]

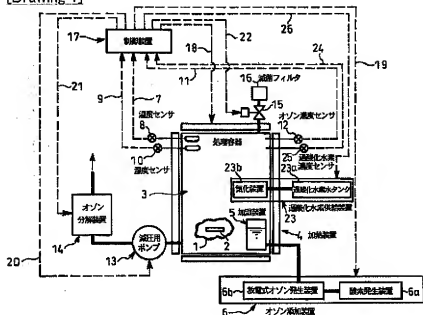
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DRAWINGS

[Drawing 1]



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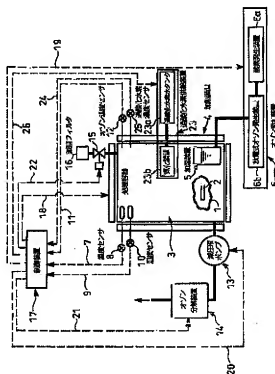
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JJ29

(54) 【発明の名称】 過酸化水素滅菌装置

(57) 【要約】

【課題】 被滅菌物に吸着した過酸化水素を水と酸素に分解して除去し得、過酸化水素の残留毒性による影響を回避し得る過酸化水素滅菌装置を提供する。

【解決手段】 滅菌バッグ1の中に入れた被滅菌物2が収納される処理容器3と、該処理容器3内に過酸化水素を供給する過酸化水素供給装置23と、該過酸化水素供給装置23から処理容器3内に過酸化水素を供給した後、処理容器3内にオゾンを追加するオゾン添加装置6とを備える。



【特許請求の範囲】

【請求項1】 被滅菌物が収納される処理容器と、該処理容器内に過酸化水素を供給する過酸化水素供給装置と、該過酸化水素供給装置から処理容器内に過酸化水素を供給した後、処理容器内にオゾンを追加するオゾン添加装置とを備えたことを特徴とする過酸化水素滅菌装置。

【請求項2】 酸素をオゾンに変換する放電式オゾン発生装置によってオゾン添加装置を構成し、該オゾン添加装置からのオゾンを加温装置を通過させて処理容器内へ添加するようにした請求項1記載の過酸化水素滅菌装置。

【請求項3】 過酸化水素を分解した後の余剰のオゾン分解して大気放出するオゾン分解装置を備えた請求項1又は2記載の過酸化水素滅菌装置。

【請求項4】 処理容器内の過酸化水素濃度を検出する過酸化水素濃度センサと、該過酸化水素濃度センサで検出された過酸化水素濃度に基づきオゾン添加量を調整する制御信号をオゾン添加装置へ出力する制御装置とを備えた請求項1、2又は3記載の過酸化水素滅菌装置。

【請求項5】 過酸化水素濃度センサで検出された過酸化水素濃度に基づくオゾン添加量を少なくし、オゾンの添加を複数回に分けて行うようにした請求項4記載の過酸化水素滅菌装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、過酸化水素滅菌装置に関するものである。

【0002】

【従来の技術】 一般に、各種医療用器具等は滅菌処理を行う必要があるが、近年、滅菌ガスとして過酸化水素 (H_2O_2) を利用することが検討されている。

【0003】 この種の過酸化水素を利用した滅菌に関する技術としては、従来、例えば、特開平11-193010号公報等に記載されたようなものが存在するが、従来の過酸化水素滅菌装置の場合、処理容器内に被滅菌物を入れ、処理容器内を減圧して過酸化水素を供給し、被滅菌物の滅菌を行った後、過酸化水素の残留毒性による影響をなくすために、処理容器内を減圧し大気を導入して換気を行うようになっている。

【0004】

【発明が解決しようとする課題】 しかしながら、前述の如く、被滅菌物の滅菌処理終了後に、単に処理容器内を減圧し大気を導入して換気を行うだけでは、被滅菌物の材質によっては、該被滅菌物に吸着した過酸化水素を除去することができず、過酸化水素の残留毒性による影響が無視できなくなるといって問題を抱えていた。

【0005】 本発明は、斯かる実情に鑑み、被滅菌物に吸着した過酸化水素を水と酸素に分解して除去し得、過酸化水素の残留毒性による影響を回避し得る過酸化水素

滅菌装置を提供しようとするものである。

【0006】

【課題を解決するための手段】 本発明は、被滅菌物が収納される処理容器と、該処理容器内に過酸化水素を供給する過酸化水素供給装置と、該過酸化水素供給装置から処理容器内に過酸化水素を供給した後、処理容器内にオゾンを追加するオゾン添加装置とを備えたことを特徴とする過酸化水素滅菌装置にかゝるものである。

【0007】 前記過酸化水素滅菌装置においては、酸素をオゾンに変換する放電式オゾン発生装置によってオゾン添加装置を構成し、該オゾン添加装置からのオゾンを加温装置を通過させて処理容器内へ添加するようにすることができる。

【0008】 又、過酸化水素を分解した後の余剰のオゾン分解して大気放出するオゾン分解装置を備えるようにすることもできる。

【0009】 更に又、処理容器内の過酸化水素濃度を検出する過酸化水素濃度センサと、該過酸化水素濃度センサで検出された過酸化水素濃度に基づきオゾン添加量を調整する制御信号をオゾン添加装置へ出力する制御装置とを備えるようにすることもでき、この場合、過酸化水素濃度センサで検出された過酸化水素濃度に基づくオゾン添加量を少なくし、オゾンの添加を複数回に分けて行うようにしてもよい。

【0010】 上記手段によれば、以下のような作用が得られる。

【0011】 処理容器内に被滅菌物を入れた状態で、処理容器内に過酸化水素供給装置から過酸化水素を供給すると、過酸化水素と菌との反応により、被滅菌物の滅菌が行われるが、前記過酸化水素供給装置から処理容器内に過酸化水素を供給した後、処理容器内にオゾン添加装置からオゾンを追加すると、過酸化水素とオゾンとの反応により、被滅菌物に吸着した過酸化水素を水と酸素に分解して除去することが可能となり、過酸化水素の残留毒性による影響が避けられる。

【0012】 前記過酸化水素滅菌装置において、酸素をオゾンに変換する放電式オゾン発生装置によってオゾン添加装置を構成し、該オゾン添加装置からのオゾンを加温装置を通過させて処理容器内へ添加するようにすると、放電式オゾン発生装置で発生する窒素酸化物を加温装置で除去しやすくなる。

【0013】 又、過酸化水素を分解した後の余剰のオゾン分解して大気放出するオゾン分解装置を備えるようにすると、過酸化水素を分解するためにオゾンが過剰に添加されたとしても、過酸化水素を分解した後の余剰のオゾンは、オゾン分解装置において分解され無害化されて大気放出されるため、残存するオゾンの処理を確実に行うことが可能となる。

【0014】 更に又、処理容器内の過酸化水素濃度を検出する過酸化水素濃度センサと、該過酸化水素濃度セン

サで検出された過酸化水素濃度に基づきオゾン添加量を調整する制御信号をオゾン添加装置へ出力する制御装置とを備えるようにすると、処理容器内の過酸化水素濃度に応じて、過酸化水素と反応させるために必要となる量のオゾンを添加することが可能となり、この場合、過酸化水素濃度センサで検出された過酸化水素濃度に基づくオゾン添加量を少なくし、オゾンの添加を複数回に分けて行うようにすると、過酸化水素に共に添加されるオゾンを全量反応させることが可能となり、オゾンが残存してしまうようなことが置かれ、無駄もなくなる。

【0015】

【発明の実施の形態】以下、本発明の実施の形態を図示例と共に説明する。

【0016】図1は本発明を実施する形態の一例であって、基本的には、滅菌バッグ1の中に入れた被滅菌物2が収納される処理容器3と、該処理容器3内に過酸化水素を供給する過酸化水素供給装置23と、該過酸化水素供給装置23から処理容器3内に過酸化水素を供給した後、処理容器3内にオゾンを添加するオゾン添加装置6とを備えたものである。

【0017】本図示例の場合、前記過酸化水素供給装置23は、過酸化水素水が貯留された過酸化水素タンク23aと、該過酸化水素水タンク23a内に貯留された過酸化水素水を気化させる気化装置23bとによって構成し、前記処理容器3には、該処理容器3内の温度7を検出する温度センサ8と、処理容器3内の湿度9を検出する湿度センサ10と、処理容器3内の過酸化水素濃度24を検出する過酸化水素濃度センサ25と、処理容器3内のオゾン濃度11を検出するオゾン濃度センサ12とを取り付ける一方、処理容器3内を滅菌処理温度範囲に加熱するヒータ等の加熱装置4と、前記処理容器3内を加温する加温装置5と、過酸化水素を供給する前に処理容器3内を減圧すると共に被滅菌物2の滅菌処理終了後に処理容器3内の過酸化水素を排気するための減圧装置としての減圧用ポンプ13と、被滅菌物2の滅菌処理終了後に前記減圧用ポンプ13の作動により排気される処理容器3内のオゾンを分解して無害化し大気放出するための触媒式等のオゾン分解装置14と、被滅菌物2の滅菌処理終了後に前記減圧用ポンプ13の作動により処理容器3内の過酸化水素を排気する際に処理容器3内へ大気を導入するためのバルブ15と、該バルブ15の開閉時に大気中に存在する菌が処理容器3内へ侵入することを防止するための滅菌フィルタ16とを設け、更に、前記温度センサ8で検出される温度7と、湿度センサ10で検出される湿度9と、過酸化水素濃度センサ25で検出される過酸化水素濃度24と、オゾン濃度センサ12で検出されるオゾン濃度11とが入力される制御装置17を設け、該制御装置17において、前記温度7、湿度9、過酸化水素濃度24、オゾン濃度11といった検出信号に基づき、前記処理容器3内の状態を把握し、前

記処理容器3内を滅菌処理温度範囲に加熱する制御信号18を前記加熱装置4へ出力し、前記処理容器3内を滅菌処理温度範囲に加熱した後に過酸化水素を供給する制御信号26を前記過酸化水素供給装置23へ出力し、過酸化水素供給後に処理容器3内へ添加するオゾン添加量を調整する制御信号19を前記オゾン添加装置6へ出力し、過酸化水素を供給する前に処理容器3内を減圧すると共に被滅菌物2の滅菌処理終了後に処理容器3内の過酸化水素を排気する制御信号20を前記減圧用ポンプ13へ出力し、被滅菌物2の滅菌処理終了後に前記減圧用ポンプ13の作動により排気される処理容器3内のオゾンを分解して無害化し大気放出する制御信号21を前記オゾン分解装置14へ出力し、被滅菌物2の滅菌処理終了後に前記減圧用ポンプ13の作動により処理容器3内の過酸化水素を排気する際に処理容器3内へ大気を導入する開放信号22を前記バルブ15へ出力するようである。

【0018】又、本図示例の場合、前記オゾン添加装置6は、酸素を発生させる酸素発生装置6aと、該酸素発生装置6aから供給される酸素をオゾンに変換する放電式オゾン発生装置6bとから構成されており、該オゾン添加装置6からのオゾンを加量装置5を通して処理容器3内へ供給するようにしてある。

【0019】次に、上記図示例の作動を説明する。

【0020】先ず、滅菌バッグ1の中に入れた被滅菌物2を処理容器3内に収納すると、温度センサ8で検出される温度7と、湿度センサ10で検出される湿度9と、過酸化水素濃度センサ25で検出される過酸化水素濃度24とが制御装置17へ入力され、該制御装置17から出力される制御信号20により減圧用ポンプ13が作動して過酸化水素を供給する前に処理容器3内が所定圧以下(約 $100\text{ [Pa Torr]} = 100 \times 1.33322 \times 10^2\text{ [Pa]}$ 以下)となるまで減圧され、制御装置17から出力される制御信号18により加熱装置4が作動して処理容器3内が滅菌処理温度範囲(例えば、およそ $35 \sim 40\text{ [}^\circ\text{C]}$ 程度)に加熱されると共に、制御装置17から出力される制御信号26より前記過酸化水素供給装置23の過酸化水素水タンク23a及び気化装置23bが作動して、該過酸化水素供給装置23の過酸化水素水タンク23aからの過酸化水素が気化装置23bで気化され処理容器3内へ供給され、被滅菌物2の滅菌処理が行われる。尚、前記過酸化水素供給装置23からの過酸化水素の供給は、前記処理容器3内が大気圧に対して降圧となる前に停止される。

【0021】前記被滅菌物2の滅菌に必要な時間が経過して滅菌処理が終了すると、処理容器3内の過酸化水素濃度24に基づき制御装置17から出力される制御信号19によりオゾン添加装置6の酸素発生装置6a及び放電式オゾン発生装置6bが作動して、該オゾン添加装置6の酸素発生装置6aからの酸素が放電式オゾン発生装

置6bでオゾンに変換され加湿装置5を通して処理容器3内へ供給される。ここで、酸素をオゾンに変換する放電式オゾン発生装置6bによってオゾン添加装置6を構成した場合、窒素酸化物が発生するが、本図示例では、オゾン添加装置6からのオゾンを加湿装置5を通過させて処理容器3内へ添加するようにしてあるため、放電式オゾン発生装置6bで発生する窒素酸化物を加湿装置5で除去しやすくなっている。

【0022】前記処理容器3内にオゾン添加装置6からオゾンが添加されると、過酸化水素とオゾンとが

【化1】 $H_2O_2 + O_3 \rightarrow 2H_2O + 2O_2$
という反応式で示されるように反応し、被滅菌物2に吸着した過酸化水素を水と酸素に分解して除去することが可能となり、過酸化水素の残留毒性による影響が避けられる。

【0023】尚、前記処理容器3内にオゾン添加装置6からオゾンを添加する前に、減圧用ポンプ13を動作させて処理容器3内を減圧し大気を導入して換気を行い、過酸化水素を一旦外部へ排出し、処理容器3内の過酸化水素濃度24を低下させてからオゾンを添加するようにしてもよく、このようにすれば、オゾンの添加量を少なくすることができる。

【0024】又、前記オゾン添加装置6から処理容器3内へのオゾン添加量は、前記過酸化水素濃度センサ25で検出された過酸化水素濃度24に応じて調整され、これにより、過酸化水素と反応させるために必要となる量のオゾンを添加することが可能となっており、この場合、過酸化水素濃度センサ25で検出された過酸化水素濃度24に基づくオゾン添加量を少なくし、オゾンの添加を複数回に分けて行うようにすると、過酸化水素に対して添加されるオゾンを全量反応させることが可能となり、オゾンが残留してしまうようなことが避けられ、無駄もなくなる。尚、前記処理容器3内のオゾン濃度11は、オゾン濃度センサ12で監視されており、万一、オゾンの処理容器3内における濃度が所定濃度を越えるようであれば、制御装置17からの制御信号19により前記オゾン添加装置6が強制的に停止され、オゾンの添加が停止される。

【0025】前記オゾンの添加による過酸化水素の分解除去が終了すると、制御装置17から出力される制御信号20により前記減圧用ポンプ13が再び動作し且つ制御装置17から出力される制御信号21によりオゾン分解装置14が動作するため、過酸化水素を分解するためオゾンが過剰に添加されたとしても、過酸化水素を分

解した後の余剰のオゾンは、前記オゾン分解装置14において分解され無害化されて大気放出され、残存するオゾンの処理を確実に行うことが可能となり、続いて、制御装置17から出力される開放信号22によりバルブ15が開放され、大気が滅菌フィルタ16を介して処理容器3内へ導入された後、処理容器3内の被滅菌物2が取り出される。尚、処理容器3内のオゾンの大気放出後には、バルブ15の開放により大気が処理容器3内に吸い込まれる形となるが、大気は滅菌フィルタ16を通過するため、大気中に存在する菌が処理容器3内へ侵入する心配はない。

【0026】こうして、被滅菌物2に吸着した過酸化水素を水と酸素に分解して除去し得、過酸化水素の残留毒性による影響を回避し得る。

【0027】尚、本発明の過酸化水素滅菌装置は、上述の図示例にのみ限定されるものではなく、オゾン添加装置は水を供給することによってオゾンを生成する電解式のものを使用してもよいこと等、その他、本発明の要旨を逸脱しない範囲内において種々変更を加え得ることは勿論である。

【0028】

【発明の効果】以上、説明したように本発明の請求項1〜5記載の過酸化水素滅菌装置によれば、被滅菌物に吸着した過酸化水素を水と酸素に分解して除去し得、過酸化水素の残留毒性による影響を回避し得るという優れた効果を奏し得る。

【図面の簡単な説明】

【図1】本発明を実施する形態の一例の概要構成図である。

【符号の説明】

- | | |
|----|------------|
| 1 | 滅菌バッグ |
| 2 | 被滅菌物 |
| 3 | 処理容器 |
| 4 | 加熱装置 |
| 5 | 加湿装置 |
| 6 | オゾン添加装置 |
| 6b | 放電式オゾン発生装置 |
| 14 | オゾン分解装置 |
| 17 | 制御装置 |
| 19 | 制御信号 |
| 23 | 過酸化水素供給装置 |
| 24 | 過酸化水素濃度 |
| 25 | 過酸化水素濃度センサ |

【图 1】

